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INFLUENCE OF BIOFERTILIZER AND FARM YARD MANURE ON GROWTH, YIELD AND SEED QUALITY OF MUSTARD (BRASSICA JUNCEA L.) IN RAINFED CONDITION

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ABSTRACT

A field experiment was conducted during Rabi season, 2015-16 at the Karguan Agriculture Farm, Karguan Jhansi during the year 2015-16 to study Influence of biofertilizer and farm yard manure on growth, yield and seed quality of mustard (Brassica juncea l.) cultivar Kranti. Seven treatments consisting of 100 and 50 % of the recommended dose of fertilizers (RDF) (80kg N + 40 kg P_2O_5 + 40kg K_2O ha^{-1}) either alone or with successive addition of farmyard manure (FYM), and Azotobacter were tested. Application of 50 % recommended dose of fertilizers along with farmyard manure and Azotobacter (seed treatment) resulted in maximum plant height, number of primary branches per plant, number of secondary branches per plant, number of siliqua per plant, number of seed per siliqua, test weight and higher seed yield. The variations in growth and yield between 100 and 50 % recommended dose of fertilizers with farmyard manure, and Azotobacter were significant. Significantly higher germination percentage, root length, shoots length and seed vigour index was recorded at 50 % recommended dose of fertilizers with farmyard manure, and Azotobacter than over control.

KEYWORDS: Growth, Biofertilizer, FYM, Seed Quality and Seed Yield

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Original Article

INTRODUCTION

Rapeseed-mustard crops (Brassica rapa, B. juncea and B. napus) are important for the Indian economy, since India imports large quantities of edible oils despite having the largest area of cultivated oilseeds in the world. Oil seeds play an important role in Indian Agriculture and industries. Besides, immense value in our diet, oils and fats are used in cosmetics, soaps, lubricants, paints and varnish industries and their medicinal and therapeutic value. The requirement of vegetable oils and fats will be much higher in coming years in view of ever increasing population. India would need 58 million tonnes of oilseeds by 2020 for maintaining minimum edible oil requirement of 12 kg capita-1 annum·1 (Mittal, 2008) from the present level of 8.2 kg (Anonymous, 2007). To produce an additional quantity of oilseed, the only option is to enhance productivity under the limited land resource condition. Among the oilseeds crop, rapeseed and mustard occupy rank next to soybean in acreage and production. The inadequate supply of inputs often leads to limit the yield potential of rapeseed and mustard (Anonymous, 2006).

Identification of the critical inputs to enhance the mustard production is need of hour. Apart from improved varieties and judicious irrigation, use of balanced fertilizers is critical for realizing higher yield. Under such situation organic manures can be exploited to boost the soil health condition vis-a-vis production of crops and

to improve fertilizer use efficiency. However, the use of total organic or inorganic nutrient sources has some limitations (Kandpal, 2001). Balanced combination of FYM, biofertilizers and chemical fertilizers facilitate profitable and sustainable production (Singh and Sinsinwar, 2006).

MATERIALS AND METHODS

The experiment was carried out during *rabi* season of 2015-16 at the Karguan Agriculture Farm, Karguan Jhansi situated at latitude 25.45 North and longitude 78.58 East. The soil of the experimental field was red soil having having pH 7.3, organic carbon 0.52%, available nitrogen 162.7 kg N ha^{-1}, available phosphorus 18.5 kg P ha^{-1}, available potassium 200.3 kg K ha^{-1}.The experiment consisted of seven treatments *viz.*, T_1- Control, T_2 -100 % RDF + 2 t FYM ha-1, T_3 - FYM @2.5t/ha, T_4 – Azotobactor (Seed treat.), T_5 -50% RDF+ FYM 2.5t/ha, T_6 -50% RDF+ Azotobactor (Seed treat.) and T_7-50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.) laid out in randomized block design with three replications The inorganics were supplied through urea, diammonium phosphate, muriate of potash. The mustard variety *'Kranti* was sown in rows 30 cm apart on 20th October, 2015, respectively. Thinning was done 15 days after sowing to maintain plant to plant distance 15 cm. The FYM was applied in furrows 15 days before sowing as per the treatment. Full dose of phosphorus, potassium, and half of nitrogen (as per treatment) were applied at the time of sowing. Remaining half of nitrogen was applied after first irrigation. The crop was harvested in the month of March during the years. For recording growth character (plant height, number of primary branches per plant and number of secondary branches per plant), yield contributing characters (number of siliqua per plant, number of seed per siliqua, test weight and higher seed yield), seed quality parameters namely (germination percentage, root length, shoot length and seed vigour index) were recorded.

RESULTS AND DISCUSSIONS

Growth parameters plant height, number of primary branches per plant and number of secondary branches per plant increased with the successive addition of FYM and *Azotobacter* with 50 % of RDF significant differences at harvest stage (Table 1). Highest plant height(187.52 cm), number of primary branches per plant(6.18) and number of secondary branches per plant(11.83) were recorded with the integrated application of 50% RDF along with FYM and *Azotobacter* (Seed treatment) which was significantly superior over T_2, T_5, T_6, T_3, and T_4 plant height, number of primary branches per plant and number of secondary branches per plant respectively. All these treatments were statistically at par with each other. Minimum plant height (156.30 cm), number of primary branches per plant (3.56) and number of secondary branches per plant (6.76) were recorded in T_1 (absolute control). These results were supported by the findings of Patel and Meisheri (1997), Gurjar and Chauhan (1997) and Mandal and Sinha (2002).

Data on given in Table-1showed that 50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.) significantly increased number of siliqua per plant of mustard. The maximum number of siliqua per plant (199.00) was recorded in T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.) which was significantly superior over T_2, T_5, T_6, T_3, and T_4 having 195.20, 193.00, 190.40, 188.30, and 185.20 number of siliqua per plant respectively. All these treatments were statistically at par with each other. Minimum number of siliqua per plant (167.00) was recorded in T_1 (absolute control) which showed significant differences with all other treatments.

Data regarding number of seed per siliqua and seed yield presented Table -1showed the maximum number of seed per siliqua (11.82) and seed yield (15.82ha^{-1}) were recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.), whereas minimum values of number of seed per siliqua (9.24) and seed yield (11.56ha^{-1}) were recorded under the

control plot. These findings was strongly supported by Singh *et al.* (2001), Shankar *et al.* (2002), Dhaka and Satish (2003), Singh and Rana (2006), Tripathi *et al.* (2011), Chauhan *et al.* (2012), Hardev et *al.* (2013) and Kumawat *et al.*(2014).

The data indicated that the quality parameters of mustard such as 1000 seed weight (Table-1) significantly with the treatments. The maximum 1000 seed weight (6.02 g) were recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat), whereas minimum values of 1000 seed weight (5.34g) were recorded under the control plot.

The data indicated that the quality parameters of mustard such as germination percentages (Table-1) significantly with the treatments. The highest germination percentages (91.20%) was recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat), which was statistically at par with treatments T_2 (90.60%), T_5 (90.00%), T_6 (89.50%), T_3 (89.10%), and T_4 (88.60%). The lowest germination percentages (87.80%) were recorded in the control plot (T_1).

Data regarding root length, shoot length and seed vigour index presented Table -1showed the maximum root length (6.50cm) and shoot length (7.41 cm) were recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat), whereas minimum values of root length (3.63 cm) and shoot length (3.42 cm) were recorded under the control plot. The maximum seed vigour index (1268.52) was recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat), followed by T_2 (1180.52), T_5 (1063.80), T_6 (995.24), T_3 (883.87), and T_4 (847.90). The minimum seed vigour index (618.99) was recorded in T_1 (control). Similar result was reported by Channaveerswami (2005), Channabasanagowda *et al.* (2008) and Banashree Sarma and Nirmali Gogoi (2015).

CONCLUSIONS

In conclusion, it is stated that the application of 50 % recommended dose of fertilizers along with farmyard manure and Azotobacter (seed treatment) resulted in maximum plant height, number of primary branches per plant, number of secondary branches per plant, number of siliqua per plant, number of seed per siliqua, test weight and higher seed yield. The maximum number of siliqua per plant (199.00) was recorded in T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.). Maximum number of seed per siliqua (11.82) and seed yield (15.82ha^{-1}) were recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.). The maximum 1000 seed weight (6.02 g) were recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat.). The highest germination percentages (91.20%) was recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat). The maximum seed vigour index (1268.52) was recorded in treatment T_7 (50% RDF+ FYM 2.5t/ha + Azotobactor (Seed treat), followed by T_2 (1180.52), T_5 (1063.80), T_6 (995.24), T_3 (883.87), and T_4 (847.90).

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APPENDICES

Table 1: Mean Performance of Different Treatments for Various Seed Characters

Treatment	Plant Height (cm.)	Number of Primary Branches /Plants	Number of secondary Branches /Plants	Number of Siliqua /Plant	Number of Seeds/ Siliqua	Seed yield q/ha	1000 Seed Weight	Germination %	Root Length (cm)	Shoot Length (cm)	Seed Vigour Index
T_1	156.30	3.56	6.76	167.00	9.24	11.56	5.34	87.80 (69.56)	3.63	3.42	618.99
T_2	185.32	5.92	11.12	195.20	11.72	15.45	5.98	90.60 (72.15)	6.47	6.56	1180.52
T_3	168.70	5.34	8.78	188.30	10.67	14.48	5.84	89.10 (70.72)	4.92	5.00	883.87
T_4	164.50	5.36	9.21	185.20	10.35	14.32	5.79	88.60 (70.27)	4.61	4.96	847.90
T_5	178.43	5.82	10.56	193.00	11.52	15.12	5.91	90.00 (71.56)	5.90	5.92	1063.80
T_6	175.21	5.71	10.12	190.40	11.13	14.87	5.87	89.50 (71.09)	5.42	5.70	995.24
T_7	187.52	6.18	11.83	199.00	11.82	15.82	6.02	91.20 (72.74)	6.50	7.41	1268.59
S.Em±	3.90	0.14	0.33	4.84	0.29	0.57	0.12	0.56	0.18	0.14	17.57
CD at 5%	12.02	0.45	1.03	14.91	0.90	1.75	0.36	1.70	0.55	0.41	53.30

*T_1- (Control), T_2- (100 % RDF+2.5 t FYM ha^{-1}), T_3-FYM 2.5t ha^{-1}, T_4- Azotobacter (Seed treat.), T_5- (50% RDF+ FYM 2.5t ha^{-1}), T_6-(50% RDF + Azotobacter (Seed treat.) and T_7- (50% RDF+ FYM 2.5t ha^{-1} + Azotobacter (Seed treat.)